(12)UK Patent Application (19)GB (11) 2 070 996 A

(21) Application No 8107152
(22) Date of filing
6 Mar 1981
(30) Priority data
(31) 128211
(32) 7 Mar 1980
(33) United States of America (US)
(43) Application published
16 Sep 1981
(51) INT CL³ F16B 25/00
B23B 51/08
(52) Domestic classification
B3N 5H12
B3C 1B6G 1B6N 1B6X
(56) Documents cited
GB 1249725
(58) Field of search
B3C
B3N
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(54) **Self-drilling, self tapping screws**

(57) A self-drilling, self-tapping screw has a drill tip formed by a pair of conical segments 24, 26. Each segment has a flat side and a rounded tip with one segment being longitudinally off set with respect to the other. The shorter segment 26 may have a greater inclined angle. The flat side of the second segment is coplanar with the flat side of the first segment.

The screw preferably includes a quad-lead thread 18, 20 having two crests with a first diameter and two crests with a second larger diameter. Other threads may be used.

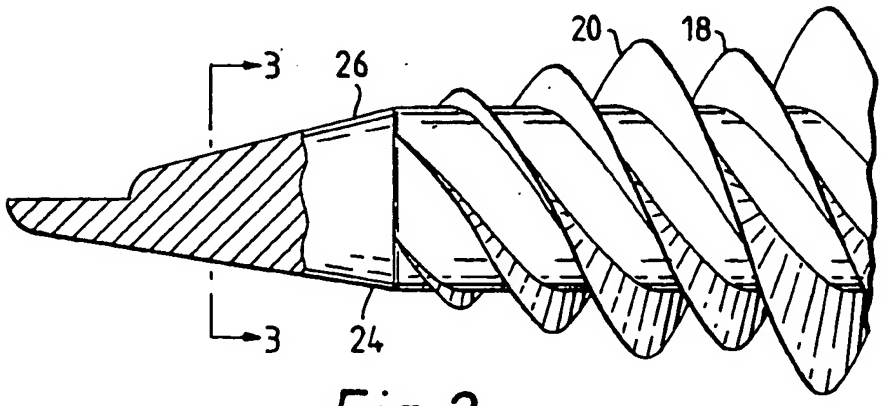


Fig.2.





GB 2 070 996 A

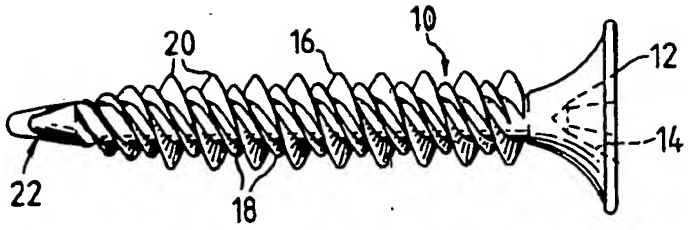


Fig.1.

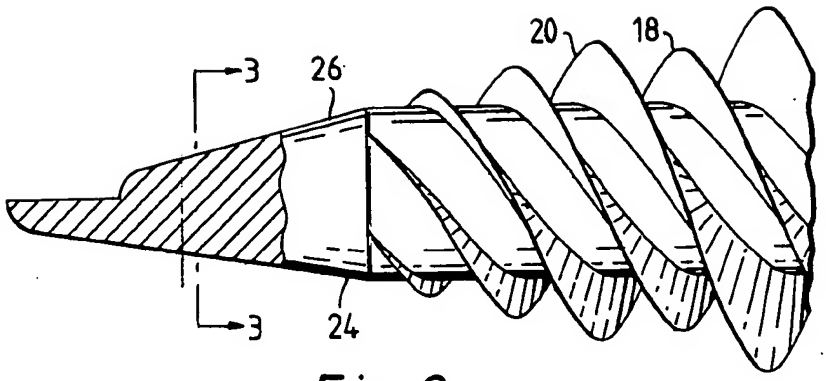


Fig.2.

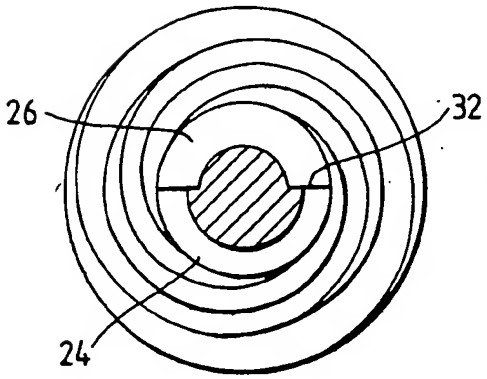


Fig.3.

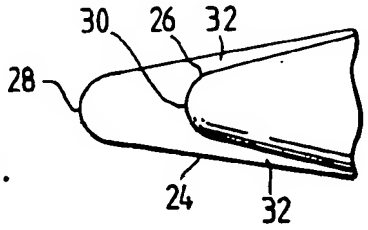


Fig.4.

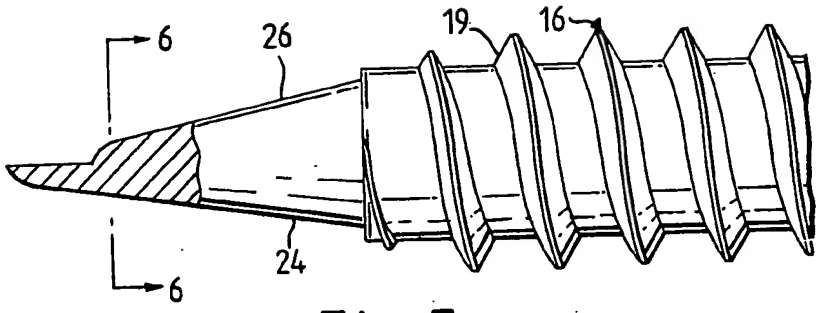


Fig.5.

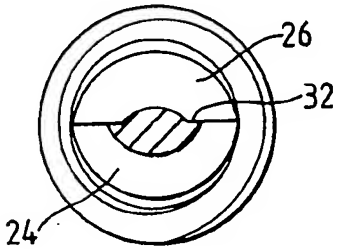


Fig.6.

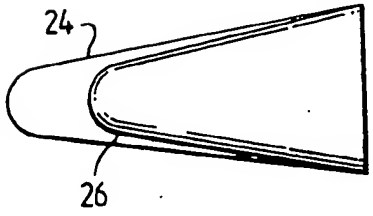


Fig.7.

SPECIFICATION

**Self-drilling, self-tapping screws**

The present invention comprises improved self-drillling, self-tapping screws comprising a head with drive-engageable surfaces at one end; a drill point at the opposite end; and a threaded region intermediate said two ends. The drill point includes two conical segments with flat sides and rounded tips. The segments are longitudinally offset along the axis of the screw with respect to one another and the flat sides are coplanar. The two angles included by the conical segments may be different, with the angle of the segment nearer the head end preferably being the larger of the two. The self-tapping thread may take any of several forms; it may be a machine thread, a type B thread, or a quad-lead thread having two threads with a first crest diameter and two threads with a second, larger crest diameter.

The screws of the present invention are particularly suitable for fastening wallboard or other panel material to steel studs. A self-drilling, self-tapping screw of the present invention has shown itself to be a faster driller than other drill screws, requires less complicated manufacturing steps and tooling to make and, therefore, can be manufactured more economically. Further, the conical segment positioned nearer the head extrudes the relatively thin metal of the stud during drilling, providing greater thread engagement with the screw. This greater thread engagement results in higher pullout values (i.e. greater holding power) for the screw. The embodiment utilizing the quad-lead thread can be utilized to further increase thread engagement due to its increased thread density. Although particularly adapted for steel studs, the screws of the present invention can be utilized in wood applications without the need for modifying configuration.

These and other features, objects and advantages of the present invention will become more apparent through reading the following description of two embodiments of the invention, in conjunction with the accompanying drawings. In these drawings:–

*Figure 1* is a top elevational view of a first embodiment;

*Figure 2* is an enlarged side elevational view in partial section of the tip region of the screw of Fig. 1;

*Figure 3* is a cross section taken along line 3–3 in Fig. 2;

*Figure 4* is an enlarged fragmentary top view of the drill tip of Figs. 1 to 3;

*Figure 5* is an enlarged side elevational view in partial section of a second embodiment;

*Figure 6* is a cross section taken along line 6–6 in Fig. 5; and

*Figure 7* is a top elevational view of the drill tip of Figs. 5 and 6.

The head 12 of the screw 10 shown in Fig. 1 has the same general configuration as is shown in U.S. Patent 3056234. This head style has proved to be particularly well suited for retention in wallboard or the like. A recess 14 provides a plurality of drive-engageable surfaces for rotationally driving the screw.

A threaded region 16 comprises a quad-lead thread configuration including two threads 18 having a first crest diameter and two threads having a second, larger crest diameter. The drill tip shown generally at 22 comprises a first conical segment 24 and a second conical segment 26. Each segment has a flat side and a rounded tip 28, 30 respectively. The second segment 26 is longitudinally offset with respect to the first conical segment 24 towards the head 12. The conical segment 26 has a larger included angle to make up for its shorter length. The flat sides of the two segments are coplanar.

The offset between segments 24 and 26 creats two flute areas 32. Due to the symmetry of the drill tip, it is capable of drilling by rotation of the screw in either direction. This drill tip can, therefore be incorporated on a screw employing a left hand thread without any modification of its configuration. As the drill tip 22 enters a steel stud, the second conical segment 26 engages the material and works it, extruding it out of the back of the hole being formed. This extrusion increases the surface area of the aperture which is available for thread engagement by threaded region 16. The greater the thread engagement, the larger the pullout value, or holding strength, of the screw. The quad-lead helps to further increase the holding strength due to the increased thread density.

A second embodiment is depicted in Figs. 5 to 7. In this embodiment, the difference between included angles of conical segments 26 and 24 is less than in the previous embodiment. Further, whereas the flat side of each segment lay generally along the axis of the respective segment in Figs. 1 to 4, the flat sides of the segments in Figs. 5 to 7 are off the axis of the respective segment, so that each conical segment comprises less than one half of a cone. Thus the point has a flattened shape. The threaded region 16 of this embodiment is shown with a type B thread 19 but it can have a machine thread or any other thread form which may be convenient.

The self-drilling, self-tapping screws shown can penetrate wallboard or the like and drill into and fasten into a steel stud. Due to the configuration of the drill tip, especially in Figs. 5 to 7, the flutes will not become packed with particles of wallboard, which can have a detrimental effect on screws of other configurations. Further, the drill tip extrudes the material as it drills, thereby increasing

the available material thickness for thread engagement. Lastly, the screws are equally well suited for use with wooden studs and need not be limited to steel stud applications.

CLAIMS

1. A self-drilling, self-tapping screw comprising a head with drive-engageable surfaces at one end; a drill point at the opposite end; and a threaded region intermediate said two ends; said drill point including a first conical segment with a flat side and a rounded tip, said first segment being at a first longitudinal position along the screw length, and a second conical segment with a flat side and a rounded tip, said segment being at a second longitudinal position along the screw length, said second longitudinal position being nearer the head then said first position, and the two flat sides being coplanar.

2. The self-drilling, self-tapping screw of Claim 1, wherein the second conical segment has an included angle different from that of said first segment.

3. The self-drilling, self-tapping screw of Claim 2, wherein the included angle of said second conical segment is greater than the included angle of said first segment.

4. The self-drilling, self-tapping screw of any of claims 1 to 3, wherein the threaded region of said screw includes at least one helical thread having a first predetermined crest diameter and at least one helical thread having a second predetermined crest diameter larger than said first diameter.

5. The self-drilling, self-tapping screw of claim 4, wherein said threaded region includes two threads having the first crest diameter and two threads having the second crest diameter.

6. The self-drilling, self-tapping screw of any of claims 1 to 5, wherein the flat side of each conical segment lies along the axis of the respective segment, so that each conical segment comprises generally one half of a cone.

7. The self-drilling, self-tapping screw of any of claims 1 to 5, wherein the flat side of each conical segment lies off the axis of the respective segment, so that each conical segment comprises less than one half of a cone.

8. The self-drilling, self-tapping screw of claim 1, substantially as described with reference to Figs. 1 to 4, or Figs. 5 to 7 of the accompanying drawings.

Printed for Her Majesty's Stationery Office
by Burgess & Son (Abingdon) Ltd.—1981
Published at The Patent Office, 25 Southampton Buildings
London, WC2A 1AY, from which copies may be obtained